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The Effects of Music Preference and Exercise Intensity on Exercise Enjoyment and Perceived Exertion

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THE EFFECTS OF MUSIC PREFERENCE AND EXERCISE INTENSITY ON EXERCISE ENJOYMENT AND PERCEIVED EXERTION

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THE EFFECTS OF MUSIC PREFERENCE AND EXERCISE INTENSITY ON EXERCISE ENJOYMENT AND PERCEIVED EXERTION

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In spite of the well-known physical and psychological benefits of exercise roughly 50% of people who start an exercise program will have dropped out within six months. Therefore, it is important to examine the determinants of exercise adherence. Past research has shown that enjoyment is an essential factor in exercise adherence. Additionally, music has been shown to influence exercise enjoyment. The music and enjoyment literature has generally included most preferred and no music conditions, yet no one has considered a least preferred music condition. Therefore, the purpose of this study is to examine the effects of music preference and exercise intensity on exercise enjoyment and perceived exertion.

Participants (N=200) began by completing a music preference questionnaire. Each participant was randomly assigned to one of three music preference conditions (most preferred, least preferred, or no music). Next, they were asked to walk/run on a treadmill at one of three randomly assigned exercise intensities (low, moderate, or high) for 20 min. Following the exercise, participants completed an exercise enjoyment scale and a music satisfaction scale. Participants completed a measure of attentional focus (AFQ) as a trait measure before the exercise and as a state measure following the exercise. Perceived exertion was measured using Borg's RPE scale at the 10 and 20- min mark.

A 3 (Music Condition) X 3 (Exercise Intensity) ANCOVA was conducted on enjoyment levels. There were no significant main effects and no significant interactions for music or intensity. A 3 (Music Condition) X 3 (Exercise Intensity) ANCOVA conducted on RPE scores revealed a significant main effect for intensity, $F(2, 166) = 99.60$, $p < .01$, $\eta^2 = .55$. There was no main effect for the music conditions and no significant interaction. A one-way ANOVA conducted on the music satisfaction questionnaire was significant, $F(1, 130) = 67.56$, $p < .00$, $\eta^2 = .34$, with those in the most preferred music condition reporting higher levels of satisfaction with music choice than those in the least preferred music condition. An exploratory analysis, a 3 (Music) X 3 (Intensity) ANOVA conducted on enjoyment using participants that had paid attention to the music revealed a significant main effect for music, $F(1,86) = 4.18$, $p = .044$, accounting for roughly 5% of the variance in exercise enjoyment.

Results of the study indicated that music preference does matter, as long as one pays attention to the music. If one pays attention to the music being played during exercise, then that person will enjoy that exercise significantly more than if she is listening to music she likes compared to music she does not like. Music preference does not appear to affect one's perceived effort during exercise. Results also revealed that the higher intensity at which a person is exercising, the more effort she will feel like she has to put forth. The results of the current study question the financial worth of health exercise facilities making music individualized for their patrons. Individualized music stations will be beneficial only to those patrons who pay attention to the music.

Chapter 1

Introduction

Regular physical activity can improve a person's health both physically and psychologically. According to the Center for Disease Control and Prevention (CDC, 2003), the long list of physical benefits of regular activity includes reducing the risk of developing and dying from coronary heart disease, stroke, and having a second heart attack; lowering both cholesterol and triglycerids and increasing lipoproteins ("good" cholesterol); reducing the risk of developing colon cancer and high blood pressure in people who already have hypertension and non-insulin-dependent (Type II) diabetes mellitus; helping people achieve and maintain a healthy body weight; helping build and maintain healthy bones, muscles, and joints; and helping older adults become stronger and better able to move about without falling or becoming excessively fatigued. "Additionally, active people have lower premature death rates than people who are the least active" (CDC, 2003, ¶ 1). The psychological benefits of physical activity are also substantial. These include reducing feelings of depression and anxiety; promoting psychological well being; reducing feelings of stress (CDC, 2003; Wankel, 1993); and improvements in self-esteem, self-confidence, and body image (Clark, Stump, & Damush, 2003; Driver, O'Connor, Lox, & Rees, 2003; Kirkcaldy, Shephard, & Siefen, 2002). Despite the plethora of benefits afforded by participating in physical activity, the CDC (2003) reported that "more than 60% of American adults do not get enough physical activity to provide health benefits" and "more than 25% are not active at all in their leisure time" (CDC, 2003, ¶ 3). Americans also have problems continuing their exercise programs once they have begun. Several studies have indicated that whether a person initiates his or her own exercise program or takes part in a standard program, approximately 50% of those persons will have dropped out within the first six months (Dishman, 1982; Morgan, 1977). What differentiates those who drop out from those who adhere? What are the determining factors that help some to continue exercising while others drop out?

Factors affecting exercise adherence

A respectable list of factors affecting exercise adherence have been identified. One factor that appears to influence exercise adherence is the social aspect of the exercise program. A study conducted by Wankel (1985) found that adherers "rated the level of friendship in the exercise group significantly higher than did the dropouts"(p. 275). Also, when Heinzelmann and Bagely (1970) questioned participants about the factors that affected their adherence to an exercise program, over one-fourth of the participants listed social aspects as well as leadership and program organization. These studies suggest that forming or having social bonds with other exercisers or being satisfied with the social environment surrounding the exerciser will motivate that person to continue exercising. Receiving support from outside of the exercise environment has also been shown to improve exercise adherence, such as support from spouses and friends (Andrew, et al., 1981; Heinzelmann & Bagely, 1970; Wankel, 1985). Results of a study conducted by Andrew et al. (1981) found that factors directly associated with the exercise environment such as convenience of exercise location and time and perception of program are related to exercise adherence as well as factors indirectly associated with the exercise environment, for example, strong beliefs in the value of exercise. The indications are that several factors outside the actual physical activity have an impact on how much a person adheres to a program. It has also be shown that individuals who have goals to develop recreational skills and social relationships, release competitive drive, and satisfy curiosity are more likely to adhere an exercise program (Wankel, 1985). Performance goal setting (participants "could set goals related to exercise duration, intensity, frequency, or improvement in a chosen outcome measure") has been shown to result in significantly less dropout in an exercise program (Annesi, 2002, p. 45). Therefore, the mindset that a person has when beginning an exercise program will also affect adherence. Furthermore, Brassington, Atienza, Perczek, DiLorenz, and King (2002) and McAuley, Jerome, Elavsky, Marquez, and Ramsey (2003) have shown self-efficacy (i.e., competence in exercise ability) to be related to adherence. In addition, research has shown that dissociation (i.e., focusing attention on music) during exercise will improve adherence (Martin, et al., 1984).

One of the most important factors influencing exercise adherence is enjoyment. Several descriptive studies using results from surveys and interviews have found enjoyment to be one of the most frequently reported reasons for adhering to an exercise program (Andrew et al., 1981; Boothby, Tungatt, & Townsend, 1981; Heinzelmann & Bagely, 1970; Jowers, 2000Perrin, 1979; Shephard, 1986). Enjoyment has also been shown to be a predictor of exercise adherence (Emmons & Diener, 1986: Wankel, 1985).

Factors affecting enjoyment

Because enjoyment was such a strong influence on exercise adherence, it is important to discuss the factors affecting enjoyment of exercise. Research on exercise enjoyment is even more limited than research on exercise adherence, but there have been a few influential studies. In a review of literature on the importance of enjoyment to adherence and psychological benefits from physical activity, Wankel (1993) examined influential factors that contribute to exercise enjoyment. Social interaction was shown to influence exercise enjoyment (Heinzelmann & Bagely, 1970; Massie & Shephard, 1971). Perceived competence and self-testing skills also influence enjoyment (Csikszentmihaly, 1975, 1988; Deci, 1975; Deci & Ryan, 1985) as well as flow elements such as realistic challenge, clear demands and feedback, focusing attention, and total absorption in the activity (Csikszentmihaly, 1978). According to Wininger and Pargman (2003), satisfaction with the exercise instructor and salience of exercise role-identity were predictors of exercise enjoyment.

Music has also been shown to be an essential factor in exercise enjoyment (Boutcher & Trenske, 1990; Karageorghis & Terry, 1997; Kendzierski & DeCarlo, 1991; Wininger & Pargman, 2003). A number of articles have discussed the general effects of music on exercise enjoyment. These studies have usually compared exercising while listening to music with exercising while not listening to music.

Music affects enjoyment

Kendzierski and DeCarlo (1991) examined the reliability and validity of the Physical Activity Enjoyment Scale (PACES). They hypothesized "that subjects who listened to music while exercising would report enjoying their exercise sessions more, as measured by their scores on the PACES" (Kendzierski & Decarlo, 1991, p. 53). The rationale behind this hypothesis was that listening to music while exercising would distract the individual from the boredom and physical discomfort caused by the repetitious aerobic exercise, therefore making it a more enjoyable experience.

The participants in this study were 37 undergraduate students between the ages of 18 and 24. The study consisted of three separate sessions. During the first session participants completed a medical-screening questionnaire. The next two sessions were held on two different days no more than two days apart. During each session the participants were asked to ride an exercise bicycle at a steady, comfortable pace that they could easily keep for 30 min. Actually the participants were stopped after 20 min. After a 4 min warm-up exercise the participant was asked to set the tension on the bike for the remainder of the session. After each session the participant filled out the PACES and a five-item questionnaire on the environmental sounds heard during the session, serving as a manipulation check to see if the participant enjoyed listening to the music in the experimental condition. Each subject rode under two counterbalanced conditions: a control condition where participants rode in a laboratory devoid of decoration and an external focus condition where the participants rode in the same room but listened to a cassette tape brought in of his or her favorite music.

The results of the study supported the aforementioned hypothesis in that participants reported enjoying the exercise more in the external focus condition (listening to music) than the control condition, as measured by the PACES ($\eta^2 = .45$). There was also a significant negative correlation illustrating that the more boredom prone the participants were, the less they enjoyed riding the bike in the room devoid of decoration.

Although an effect was found, there were limitations to the methods used in this study. The first limitation was the indistinguishable level of exercise intensity. Past research has shown that mood is affected differently by different intensities of exercise. Participants in this case were asked to set their own pace. There was no way to determine the intensity at which the participants were riding. They were told to ride at a pace they could comfortably keep for 30 min. The problem here is that a low intensity may be a comfortable pace for some participants, whereas a moderate or higher intensity may be a comfortable pace for other more physically fit participants. Participants should have either been assigned to a specific intensity or researchers should have been able to assess the intensity at which each participant was riding. The second limitation of the study was that it compared only a preferred music condition with a no music condition. A non-preferred or least preferred condition should also be included as it has practical implications such as exercising in public facilities where the exerciser does not choose the music being played.

Wininger and Pargman (2003) conducted a study in which they examined the variables believed to contribute to exercise enjoyment. Based on past research and theory, the three variables included were satisfaction with the music used in the exercise environment, satisfaction with the exercise instructor, and salience of exercise role-identity. Participants in the study were 282 female student volunteers participating in aerobic dance classes. Each class was taught by a certified female aerobics instructor and consisted of a 30-40 min aerobic workout. Participants were asked to fill out the Physical Activity Enjoyment Scale (PACES) 10 to 15 min before the class began. They also completed a series of likert-type items on musical preference and satisfaction with instructor as well as the Exercise Identity Scale (EIS). All questions on the surveys referred to the previous aerobics class. The results of this study revealed that enjoyment had the strongest positive correlation with the participant's satisfaction with the music. Also, participants' satisfaction with the music was the strongest predictor of enjoyment accounting for 21% of the variance. The main limitation of this study is the nonrepresentative sample of all female participants. Future research should include male participants.

Boutcher and Trenske (1990) looked at the effects of a sensory deprivation condition versus a music condition on perceived exertion and affect during exercise. The first hypothesis was that participants would report "lower affective responses during the deprivation condition because depriving subjects of external stimuli will cause an internal focus (similar to association) on sensations of fatigue" (Boutcher & Trenske, 1990, p. 168). The second hypothesis was that music would "increase affect responses because it will distract (similar to dissociation) individuals from focusing attention on internal feedback" (Boutcher & Trenske, 1990, p. 168).

The participants in this study were 24 untrained female undergraduates recruited from physical education classes. There were four sessions lasting approximately 40 min each conducted over a four-week period. The first session was a submaximal fitness test and the other three sessions were experimental sessions: control, sensory deprivation, and music. During the sensory deprivation condition, participants wore opaque goggles and cotton ball earplugs. During the music condition, participants listened to their favorite music through earphones. In the control condition each participant exercised with no music and no sensory deprivation. In each experimental condition participants exercised on a cycle ergometer for a total of 24 min. The exercise sessions consisted of a 3 min warm-up followed by three successive 6 min trials at workloads of 60% (light), 75% (moderate), and 85% (heavy) of their maximal heart rate, and then a 3 min cool-down. Affect was measured using a 10-point bipolar scaled developed by Rejeski (1985) and was assessed every 1, 2.5, 4, and 5.5 min of each session.

At the moderate workload results revealed that affect responses of the music condition were significantly higher than the sensory deprivation condition and control condition ($\eta^2 = .26$). Yet at the heavy workload affect responses of the music condition were only significantly higher than the sensory deprivation condition ($\eta^2 = .33$). There were no significant differences at the light workload.

There were several limitations to this study. The first limitation was that of the characteristics of the sample. Not only was the sample extremely small but it also consisted solely of females. Future research should have a larger sample size that includes males. There are three problems with the exercise task. First, the researchers used 60%, 75%, and 85% of the maximal heart rate as light, moderate, and heavy workloads, respectively. All workloads are higher than they should be. According to the American College of Sports Medicine, 60% is classified as "moderate," and both 75% and 85% are classified as "hard" (ACSM, 2000). The other problem with the exercise task is that the different workloads were performed consecutively in the same session. The effects of riding at the heavy intensity cannot be assessed independent of the effects of the two previous workloads. Third, the duration of the three consecutive workloads is only 6 min. This duration may not be long enough to accurately assess the effects on mood. Lastly, the study only compared a preferred music condition with a no music condition. As stated previously, a non-preferred or least preferred music condition should also be included.

In a review of the psychophysical effects of music in sport and exercise Karageorghis and Terry (1997) concluded that there is strong evidence that music does augment mood during exercise. They theorized that, like the dissociative cognitive strategy, music acts as a distracter during exercise diverting the exerciser's attention away from feelings of physical discomfort, which will induce a positive mood state.

Hayakawa, Miki, Takada, and Tanaka (2000) conducted a study in which they hypothesized that listening to music during exercise would induce a more positive mood than not listening to music. The participants in the study were 16 middle-aged women. There were three sessions on three separate days: Japanese traditional folk music, aerobic dance music, and no music. Both types of music had tempos of 120 bpm. All three exercise sessions consisted of 60 min of bench stepping exercise during which the participants maintained a heart rate between 60-90% of their maximum heart rate. An abbreviated version of the Profile of Mood States (POMS) was completed before and after each session and rate of perceived exertion (RPE) was assessed every 5 min using Borg's 15-point scale.

Results of the study revealed that higher levels of fatigue were reported after the no music condition compared to either music conditions ($\eta^2 = .27$). There were no significant differences between the two music groups themselves. The implication is that using music as a distracter during exercise may help reduce feelings of fatigue. Fatigue was the only factor on the POMS that produced significant results for any of the conditions. Also, there were no significant findings as regards RPE scores.

There were a variety of limitations to this study. The first limitation was the sample characteristics. The sample was both small and consisted solely of females. Another problem was the exercise intensity. Participants were asked to keep their heart rates between 60 and 90% of their maximum heart rate. The problem with that request is that 60% of a person's maximum heart rate has been categorized as moderate intensity and 90% of a person's maximum heart rate has been categorized as a hard intensity (ACSM, 2000). Following, 60% and 90% of a person's maximum heart rate are not at the same level of intensity. Therefore, there was no way of knowing the exact intensity at which the participants were exercising. Research has suggested a relationship between RPE and intensity and therefore the inconsistency in intensities may have affected the reported RPE differences. The last problem was that there was no assessment of music preferences.

Harte and Eifert (1995) investigated the effects of running, environment, and attentional focus on mood. Participants were 10 male amateur triathletes or marathon runners. There were four different counterbalanced conditions on four separate days: control, indoor 45 min run with external stimuli (outdoor noises tape), indoor 45 min run with internal stimuli (headphones listening to their chest), and an outdoor 12 km run. The Profile of Mood States (POMS) adjective checklist was used to assess mood before and after each session.

Results revealed that following the outdoor condition, participants were less tense ($\eta^2 = .55$), compared to the indoor internal focus and control conditions, less depressed ($\eta^2 = .26$) compared to all other conditions, less angry and hostile ($\eta^2 = .53$) compared to the indoor internal focus condition, and more invigorated ($\eta^2 = .52$) compared to the indoor internal focus and control conditions.

The first limitation of this study was the small and unrepresentative sample of all males. Also, the exercise intensities were unknown. Since research shows that mood is affected differently by different intensities, the unknown intensities could have certainly affected the results.

There have been a number of studies that have also compared the effects of different types of music (varying tempo) on affect. For example, in a study examining the relationship between music and affect, Wales (as cited in Wininger & Pargman, 2003) found lowered anger, fatigue, and depression in the music condition with a positive disposition (upbeat/stimulative) but not in the music with a negative disposition (slow/sedative). The results of this study suggested that upbeat music has a more positive effect on mood than does slow music. Lee (as cited in Wininger & Pargman, 2003) also investigated the effects of varying music on affect during submaximal treadmill running. A music-rating inventory (MRI) was used to assess affect. The MRI consisted of 10 positive and 10 negative music mood adjectives. Results indicated that higher positive mood states and lower negative mood states were found in the upbeat music condition compared to both the slow music conditioned and the control condition. Yet another study conducted by Brownely, McMurray, and Hackney (1995) varied music tempo during exercise. They found that participants exhibited more positive affect when listening to upbeat (154-162bpm) music as compared to listening to slow sedative music (bpm not reported) or no music at all. In summary, research conducted on varying music tempos has supported the fact that upbeat music has a more positive effect on mood as compared to slow music or no music.

Logically, a person who does not think about the physical discomforts of exercise should enjoy the exercise more than a person who does. Pennebaker and Lightner (1980) proposed that external focus (dissociation) might lessen the perception of physical symptoms and fatigue at the same time increasing enjoyment of exercise. There has been a considerable amount of research conducted on the effects of listening to music during exercise on RPE. Although there are methodological gaps in the research, results strongly suggest that listening to music during exercise lowers levels of perceived exertion and fatigue. Music is often used as a cognitive distracter during exercise. This distracter is suggested to be the cause of the lower RPEs. This concept has been supported by extensive research that has shown that presenting an exerciser with a cognitive distracter (dissociation) will produce lower reported RPEs compared to no cognitive distracter (association).

Preferred intensity

Recently researchers have begun to consider the psychological effects of preferred exercise intensity. Parfitt, Rose, and Markland (2000) investigated the "effects of prescribed and preferred intensity exercise on affect and interest-enjoyment in active individuals" (p. 233). They hypothesized that feelings of enjoyment would be greater following the preferred intensity compared to the prescribed intensity.

The participants included 12 male and 14 female undergraduates who were classified as active and healthy via self-report. The study consisted of three sessions. The first session was a familiarization session during which estimated VO_2max was assessed by submaximal exercise test. Participants also completed baseline measures of the Subjective Exercise Experience Scale (SEES) before and after the submaximal exercise test. The next two sessions, separated by seven days, were counterbalanced exercise sessions at either the participant's preferred intensity or a prescribed intensity. One session consisted of 20 min of exercise on a treadmill at 65% of their estimated VO_2max. The SEES was completed immediately before the exercise, every 5 min during the exercise, and following a 5-min cool-down after the exercise. Ratings of perceived exertion were assessed every five min using Borg's RPE scale. Enjoyment was assessed following the exercise using the Intrinsic Motivation Inventory (IMI). The third session followed the same protocol with the exception of exercise intensity. In the prescribed intensity session participants were asked to "select an intensity that you prefer that can be sustained for 20 minutes and that you would feel happy to do regularly"(p. 234). The participants were allowed to change the intensity every five min if they wanted.

Results revealed no significant differences in affect between sessions. Although there were no significant differences in enjoyment among sessions, mean differences showed that participants enjoyed the exercise more in the preferred intensity condition compared to the prescribed intensity condition. The difference may have been insignificant due to the fact that all participants were active and fit and therefore probably enjoyed exercise to begin with.

Dishman, Farquhar, and Cureton (1994) examined the effect of preferred intensity exercise on state anxiety in men at differing activity levels. Participants consisted of 23 males, ages 18-31 years. Based on self-reported exercise over the previous 12 months, 12 participants were classified as low-active and 11 were classified as high-active. The first session determined the peak oxygen uptake of the participants. The second session took place two weeks later and consisted of exercising for 20 min on a stationary bike at their preferred intensity. They were given the opportunity to change the intensity every five min Ratings of perceived exertion were assessed every 5 min using Borg's RPE scale. Spielberger's 10-item State Anxiety Inventory was completed 1 min before exercise, every 5 min during the exercise, and 1 min after the exercise.

Results indicated that only high-active participants had a significant reduction in state anxiety following the exercise. There were no overall differences in chosen intensity between the low and high-active groups. There were no overall differences in chosen intensity between the low and high-active groups. One limitation of the study was that it looked only at preferred intensity exercise rather than comparing prescribed intensity to preferred intensity exercise.

In conclusion, the effects of exercising at a preferred intensity on enjoyment or mood have not been investigated thoroughly and results are unclear. Although there were no significant differences, observed mean differences suggest that exercising at a preferred intensity may have an effect on enjoyment. Therefore, there is a need for the issue to be further examined.

Music and RPE

Copeland and Franks (1991) conducted a study in which they hypothesized that listening to music during exercise would cause an external focus of attention (dissociation) and increase time to exhaustion. Participants in this study were 24 apparently healthy college volunteers (13 females, 11 males) from physical activity classes. Each of the participants was randomly assigned to one of three groups: high intensity or upbeat music (140 bpm), low intensity or slow music (100 bpm), and a no music condition. Each participant was asked to complete a multistaged progressive walk/run maximum treadmill test. Treadmill speed and/or grade were increased every 2 min until the participants reached voluntary exhaustion. Rate of perceived exertion (RPE) was assessed using Borg's 10-point scale. After the exercise was complete, participants were asked to recall their RPE at five different intensity points during the test: light, low-moderate, high-moderate, heavy, and cool-down.

Results of the study revealed that the time to exhaustion was significantly longer during the slow music condition compared to the control condition ($\eta^2 = .20$). However, there were no significant findings regarding to the fast music condition. Also, there were no significant differences between groups on RPE.

There were several limitations of this study. First, even though two types of music (upbeat and slow) were presented, there was no measure of music preference. It may be possible that some participants in the upbeat condition preferred upbeat music and others in the same condition preferred slow music which could have affected the participant's perceived exertion. Further, the music genre was not reported. Also, the RPEs for various windows of time were obtained after the exercise was complete. The researchers stated that the purpose to keep attentional focus from switching from external to internal during the exercise. Although a legitimate concern, this method may have biased the RPE self reports. Lastly, the tempo of the music used was reported but the type (i.e., classical, pop, etc.) was not.

In a study conducted by Potteiger, Schroeder, and Goff (2000) it was hypothesized that participants would report lower RPE scores when listening to music during exercise compared no music. Participants in this study were 27 physically active volunteers (13 females, 14 males). Each participant attended five sessions separated by at least two days. The first session was a graded exercise test to exhaustion for VO_2 peak. Next were four counterbalanced conditions: jazz, or fast music (140-145 bpm), classical (60-65 bpm), self-selected (unknown bmp), and no music. In each of the four sessions participants rode a bike for 20 min at 70% of their VO_2peak. RPE was assessed every 5 min using Borg's 15-point scale. Results of this study indicated that while in the no music condition, participants reported significantly higher RPEs at all assessment points compared to all other conditions, thereby suggesting that listening to any type of music during exercise reduces feelings of discomfort. Analyses revealed no other differences among any of the other conditions.

The major methodological flaw of this study was in the music conditions. Participants listened to fast, slow, and self-selected music. It is unknown whether or not the self-selected music matched the tempo or genre of either the slow or fast condition. Also, there was no comparison of preferred and non-preferred music.

The previously discussed study by Boutcher and Trenske (1990) hypothesized that participants would report higher RPEs during a sensory deprivation condition and lower RPEs during a music condition at varying exercise intensities. Results revealed that only during the light workload (not in moderate or high) RPE was reported as significantly lower in the music condition compared to both the sensory deprivation and control condition ($\eta^2 = .27$). The suggestion is that when there is no distracter (i.e., music), exercisers will attend more to the amount of exertion they are putting forth.

The research discussed in this section demonstrated the relationship between listening to music during exercise and RPE and fatigue. In each study music acted as a distracter. There has been a vast amount of research that uses other cognitive distracters (dissociation) besides music, however. This research has established a relationship in which induction of dissociation during exercise leads to lower reported RPE scores. Dissociation occurs when the exerciser focuses his or her attention on external factors such as past life events, watching a video, or listening to music; whereas association occurs when the exerciser focuses his or her attention on internal body feedback such as heart rate, muscle pain, or feelings of exertion.

Why do researchers investigate the effects of the implementation of cognitive strategies during exercise on RPE? The concept behind using a dissociative cognitive strategy during exercise is that it will distract the attention of the exerciser away from the physical discomforts caused by the exercise. This distraction will reduce the exerciser's perceived exertion. When association is used, the exerciser monitors bodily feedback, concentrating on the immediate physical effects of the exercise thereby the exerciser to be very sensitive to the amount of energy being applied, which will in turn increase perceived exertion. The general method employed by the research on cognitive strategies is to compare an associative condition to a dissociative condition. However, as shown in the following section, some recent research has separated both association and dissociation further into internal and external categories.

Cognitive strategy and RPE

Both Harte and Eifert (1995) as well as Russell and Weeks (1994) asked participants to exercise under varying counterbalanced cognitive strategy conditions (i.e., internal dissociative, external dissociative, etc). In the study conducted by Harte and Eifert (1995), participants ran for 45 min at an unknown intensity in each condition and RPE was assessed before and after using Borg's scale. On the other hand, Russell and Weeks (1994) asked participants to ride a bike for 60 min at 75% of their maximal heart rate and RPE was assessed every 5 min using Borg's scale. Results of these studies were mixed. Harte and Eifert (1995) found that significantly higher RPEs were reported after the association condition compared to the dissociation condition ($\eta^2 = .81$). Analyses by Russell and Weeks (1994) produced no significant findings.

Although significant results were produced by one of the studies, both studies were not without their weaknesses. For example, Harte and Eifert (1995) did not assess exercise intensity, which is problematic because research has shown exercise intensity and RPE to be related. The study conducted by Russell and Weeks (1994) had several weaknesses that may explain the lack of significant findings. These include an extremely small and unrepresentative sample (seven males) and questionable induction of the dissociative cognitive strategy. Also, participants reported RPE 12 times throughout the exercise, which may have actually caused the exercisers to associate during the dissociative condition.

Johnson and Siegel (1992) randomly assigned participants to one of four conditions (control, internal dissociation, external dissociation, and association), asked them to ride a bike for 15 min at 60% of their VO_2max (aerobic capacity), and assessed RPE after the exercise using Borg's scale. Courture, Jerome, and Tihanyi (1999) also randomly assigned participants to one of the same four conditions. They were then asked to swim 500 meters as fast as comfortably possible and RPE was reported after the swim using Borg's scale. Results of these studies were mixed. Johnson and Siegel (1992) found that the association group reported significantly higher RPEs than the internal dissociation group ($\eta^2 = .23$). On the other hand, Couture, Jerome, and Tihanyi (1999) found no significant differences between groups. The lack of significance could have been due to the fact that only 30.4% of the participants actually used their assigned strategy throughout the entire swim. Also, there was no measure of exercise intensity; therefore, it is possible that intensities ranged anywhere from low to high.

Connolly and Janelle (2003) took things a step further and divided both dissociation and association into internal and external. They attempted "to advance understanding of association and dissociation attentional styles by assessing rowing performance during low and high intensity workouts" (Connolly & Janelle, 2003, p. 197) by conducting two experiments.

Participants in experiment one were nine female varsity rowers. They were randomly assigned to either an association (internal) condition or a dissociation (external) condition in which they were given appropriate instructions. Participants exercised on a rowing ergometer for 20 min and were told to ride at a steady state. One week later each participant completed the same exercise in the other counterbalanced cognitive strategy condition. RPE was assessed every 4 min using the Borg scale.

Analyses found no significant differences in RPE between the two groups. The lack of significance could be due to any of the number of limitations of this study. The first reason could have been the small and unrepresentative sample of females. More importantly, the lack of significant findings could have been due to the fact that RPE was being reported during the exercise, causing those in the dissociation condition to associate and in turn increasing feelings of discomfort for that condition. Also, no measure of the cognitive strategies was used as a manipulation check. Thus, it is unclear as to whether or not the assigned cognitive strategy was used.

Participants in experiment two were 12 female and male varsity rowers. There were five sessions completed in five, one-week intervals. During the first session participants filled out the Attentional Focusing Questionnaire (AFQ) to assess their natural attentional style. Next, participants completed the baseline piece of 2000 meters on a rowing ergometer. During all sessions participants were asked to keep their heart rates between 160 and 180 bpm. There were four experimental conditions (two association and two dissociation) that were counterbalanced. During the internal association condition participants "were asked to monitor how their body felt, breathing, and their technique while erging" (Connolly & Janelle, 2003, p. 203). While in the internal dissociation condition they "were asked to solve problems in their minds while they erged" (Connolly & Janelle, 2003, p. 203). They "were asked to race and strategize against the other two participants in the condition to attempt to finish first" (Connolly & Janelle, 2003, p. 203) in the external association condition. During the external dissociation condition they "were asked to watch a video on perception during the ergometer session" (Connolly & Janelle, 2003, p. 204). Participants reported RPEs at the end of each session using Borg's RPE scale. Also, after each session participants were asked to indicate the percent of time they spent focusing in the assigned cognitive strategy.

Results of the study showed that the assigned cognitive strategy was used 60% - 90% of the time. RPE analysis revealed a main effect for strategy ($\eta^2 = .21$). Post hoc analyses showed significantly higher RPEs in both the internal and external associative conditions compared to baseline. Therefore, association yields higher RPE than dissociation no matter the type (internal or external).

It would have been beneficial to this study if conditions of varying intensities had been included. Further, all participants were asked to keep their heart rate between 160 and 180 bpm; therefore, they were required to associate even in the dissociation conditions. Also, the reported percent of time spent focusing on the assigned strategy may have had an effect on the results. The percents ranged from 60% to 90%, indicating that some participants were only employing the assigned strategy just over half of the time.

Schomer (1986) looked at cognitive strategies and RPE in a different way in that participants reported the cognitive strategy they naturally used rather than being assigned to a condition. He conducted a study in which he investigated "the relationship between associative thinking and perception of training intensity in marathon runners" (Schomer, 1986, p. 41). Participants in this study were 12 novice runners, 10 marathon runners with minimum experience, and nine highly competitive runners. The runners were asked to wear a recording device while on their training runs to report what they were thinking about during the run. They also reported their RPE according to the Borg scale after every run. The comments were classified into 10 different categories and then separated into two groups: association (four) and dissociation (six).

Results revealed a strong relationship between associative cognitive strategy and higher levels of RPE ($\eta^2 = .88$), an insinuation that the exerciser will be more aware of the physical demands of the exercise when there is no cognitive distraction.

There are several limitations to this study. The first problem is the small sample size. Secondly, the intensities and durations of the runs were not known. This limitation is a huge one considering research has shown that RPE is affected differently by different durations and intensities. Therefore, it is virtually meaningless to compare RPEs between cognitive strategies across varying durations and intensities.

In summary, the methodology used in the literature on cognitive strategies and RPE takes many different forms. It is logical to separate dissociation into internal and external, as it is possible to use different types of distracters. An exerciser can divert attention away from exercise by focusing on certain internal things like thoughts concerning past experiences, personal relationships, or future plans. External distracters can also be used such as paying attention to scenery, carrying on a conversation with a fellow exerciser, or listening to music. However, it is not logical to divide association into internal and external. The concept behind association is that the exerciser focuses on bodily feedback making the exerciser aware of the physical demands being placed on the body. Bodily feedback cannot be separated into internal and external, as all bodily feedback is internal.

The general results of this research support the theory that using an associative cognitive strategy during exercise will increase RPE. Even though there have been studies that did not support this theory, the methodologies of these studies contain critical weaknesses that may serve to explain the null findings.

Finally, using a dissociative cognitive strategy has also been shown to influence exercise adherence. Martin et al. (1984) conducted a study in which they hypothesized that exercisers that used dissociative cognitive strategies would have better adherence rates than exercisers that used associative cognitive strategies. In this study, there were 16 participants who were matched for sex and initial fitness and were randomly assigned to either the associative or dissociative cognitive strategy group. The participants met twice a week for 12 weeks during which time they exercised for anywhere from 15 to 45 min. Attendance was used as the measure of adherence. Results of the study revealed that the exercisers using the dissociatve cognitive strategy had higher attendance than exercisers using the associative cognitive strategy ($\eta^2 = .34$). Also, at three-month and six-month follow-ups, more dissociative exercisers than associative exercisers were still exercising. The major limitation of this study was that there was no measure of whether or not the assigned cognitive strategy was actually used. If the exercisers did not use the assigned strategy, then the findings may not be valid.

Music as a distraction

The research discussed in this paper has demonstrated that listening to music during exercise tends to increase enjoyment and consequently improves exercise adherence. Additionally, it has been shown that listening to music and generally dissociating during exercise reduces perceived exertion, which in turn should increase enjoyment. It has been shown that music does act as a distracter. When Pica (1995) examined the experience of dissociation during positive situations he found listening to music to be one of the most frequently listed distracters, thus suggesting that music is used for general dissociation. Numerous exercise studies have used music as their "distracter" when comparing internal focus conditions (associative) to external focus conditions (dissociative) (Annesi, 2001; Boutcher & Trenske, 1990; Kendzierski & DeCarlo, 1991; Potteiger, Schroeder, & Goff, 2000; Rejeski, 1985). Music facilitates dissociation by diverting attention away from feelings of discomfort and therefore making the exercise a more enjoyable experience.

Summary

In summary, this paper has discussed two very important factors that affect exercise adherence: enjoyment and dissociation. Enjoyment has been shown to be one of the most salient factors influencing adherence. Research has demonstrated a strong relationship between listening to music during exercise and enjoyment. Furthermore, reduction in RPE, by logic, will improve exercise enjoyment. Research has shown that both listening to music and generally dissociating during exercise reduces RPE. Music has been used as a distracter to induce dissociation during exercise. Additionally, research implicating other methods of dissociation has also produced improvements in adherence to exercise programs.

Although there has been a small amount of exercise research comparing a preferred music condition with a no music condition, research including a least preferred music condition is nonexistent. Therefore, the current research is important for two reasons. The first reason is attributable to the void in literature concerning the effects of music preference on exercise enjoyment and RPE. The second reason is that this research has valuable applicability. Knowledge gained from this research will benefit public exercise facilities in which exercisers have no choice in the music being played. The facilities need to be aware that the music being played may critically affect an exerciser's enjoyment and RPE, which in turn may determine whether exercisers continue exercising at a given facility.

Hypotheses

Based on past research, it is hypothesized that participants in the most preferred music condition will report higher levels of enjoyment than those in the least preferred and no music conditions. It is further hypothesized that participants in the low intensity exercise condition will report higher levels of enjoyment than those in the moderate and high intensity conditions. Thus, it is hypothesized that those in the most preferred music and low intensity condition will report the highest levels of enjoyment. Additionally, it is hypothesized that participants in the most preferred music condition will report lower RPE scores than those in the least preferred and no music conditions. It is further hypothesized that participants in the low intensity exercise condition will report lower RPE scores than those in the moderate and high intensity conditions. Thus, it is hypothesized that those in the most preferred music and low intensity condition will report the lowest RPE scores. Finally, it is hypothesized that the three subscales of the trait AFQ (association, dissociation, and distress) and the preferred RPE will act as covariates.

Chapter 2

Method

Participants

There were 200 participants (126 female, 74 male) with a mean age of 20.69 (SD = 4.41) ranging from 18 to 50. Participants were recruited from Psychology classes. Extra credit was offered for participating. Students who did not wish to participate were given an equivalent opportunity for earning extra credit (e.g., reading a research article and answering comprehension questions about the article). Two screening protocols were implemented in order to assure the acquisition of low risk subjects. A copy of the Physical Activity Readiness Questionnaire (PAR-Q) was posted by the sign up sheet. Students were informed that if they answer "Yes" to any of the seven questions on the PAR-Q that they should not participate in this study. In addition, the following age restrictions were stated: "Males between the ages of 18 and 44 and females between the ages of 18 and 54 are eligible to participate in this study."

After signing up for the study, participants who request a reminder were either emailed or called at least 24 hours prior to their scheduled testing session. Email reminders included the "experimenter requests for participants" in the body of the message. Phone reminders included recitation of the "experimenter requests for participants." A copy of the American College of Sports Medicine (ACSM) risk stratification questions that all participants answered prior to participating in the actual study and behavioral requests for participants were also posted by the sign up sheets.

Apparatus and measures

All exercise was performed on a Landice L7 Club treadmill. The researcher used a stethoscope and stopwatch to measure heart rate. Participants completed a demographic form created by the authors (see Appendix A). A brief questionnaire developed by the authors was used to assess the participant's musical preferences for running on a treadmill. The questionnaire listed six types of music: classic rock, country, rap, hip hop, alternative, and oldies (see Appendix B). Participants were required to rate on a scale of 1 (not at all) to 7 (very much) how much they would prefer to listen to each type of music while running on a treadmill. They were also asked to select which of the six types of music are their most preferred and least preferred types of music to listen to while running on a treadmill. Most preferred and least preferred music types were selected using the selection portion of the questionnaire by having the participants in the most preferred music condition listen to the type of music they selected as most preferred and participants in the least preferred condition will listen to the type of music they selected as least preferred. Following the exercise a questionnaire concerning music satisfaction served as a manipulation check for the music preference questionnaire. The questionnaire consisted of three items on which the participants indicated the degree to which they were satisfied with the type (i.e., country, oldies, etc.), tempo, and volume of the music (see Appendix C). They rated each item on a scale from 1 (not at all) to 5 (completely satisfied).

The Attentional Focusing Questionnaire (AFQ) was used as both a trait and a state measure to assess attentional style normally used during exercise and attentional style used during the experimental exercise bout. Before the participants exercised they were asked to rate 31-items on a scale of 1 (did not do at all) to 7 (did a lot) how much they engaged in each of the items normally during exercise (trait measure). Then, following the exercise they were asked to indicate how much they engaged in each while on the treadmill (state measure). Internal consistency reliability of the three subscales have ranged from (.81 - .88) for association, (.69 - .76) for dissociation, and (.76 - .87) for distress (unpublished research). The scale items can be found in Appendix D.

The Borg Rating of Perceived Exertion scale (RPE; Borg, 1982) provided an index of each participant's effort throughout the exercise session. The scale ranges from 6 (no exertion at all) to 20 (maximal exertion). Borg's scale has been reported to have sufficient reliability and validity (Russell & Weeks, 1994) and to be highly correlated (.80 - .90) with heart rate (Borg, 1982). Results of the current study indicated that heart rate and RPE were significantly correlated ($r=.296$). Additionally, participants were asked to indicate their preferred RPE on the demographics questionnaire. A change in RPE score was calculated by subtracting a participant's reported RPE at the end of the exercise bout from their preferred RPE.

A 4-item enjoyment scale was used to measure the participant's enjoyment level during the exercise. Items are rated on a likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Internal consistency for this measure across three studies ranged from .90 to .92. The scale items can be found in Appendix E.

Procedures

On the day of her scheduled testing session each participant entered the motivation lab (Rm. 219 Tate Page Hall), upon which she was stratified for risk by the ACSM guidelines. Only participants classified as low risk were allowed to proceed. Next, participants were asked to read the informed consent form. After the informed consent had been signed the subject began filling out the pre-exercise questionnaires. The questionnaires included: demographics (see Appendix A) and the music preference questionnaire.

After completing these questionnaires, a participant's heart rate was measured. Next, each participant was weighed and measured for height, this information was used to calculate the estimated VO_2 max. Then the participant was asked to select the volume at which they would like to exercise. A neutral type (a type which is not one of the six experimental types) of music was played for the participant and they were asked to indicate their desired volume as to control for those in the least preferred music condition turning the volume off. The experimental music came from six compact discs consisting of over 20 min of the specified type of music (roughly four to five songs) each with a tempo of roughly 130bpm built into the songs.

Each participant was randomly assigned to one of nine conditions. There were three possible music conditions: 1) most preferred music, 2) least preferred music, and 3) no music. There were three possible treadmill conditions: 1) high intensity: running on the treadmill for 20 min at 70% of estimated VO_2 max, 2) moderate intensity: running on the treadmill for 20 min at 50% of estimated VO_2 max, or 3) low intensity: running on the treadmill for 20 min at 30% of estimated VO_2 max. Each participant engaged in a 2 min warm-up and was given instructions on how to estimate her rate of perceived exertion (RPE). Each participant was asked to report her RPE at the 10 and 20 min interval.

After completion of a given condition each participant had her heart rate measured again and completed the measure of enjoyment, the AFQ, and the music satisfaction question. The entire study took approximately 45-60 min.

Chapter 3

Results

Descriptive statistics (i.e., means and standard deviations) for enjoyment by music and intensity are reported in Table 1. Descriptive statistics for RPE by music and intensity are reported in Table 2. Data for both enjoyment and RPE scores had approximately normal distributions. The internal consistencies of all measures by way of reliability coefficient alpha were as follows: Enjoyment .90, AFQ Trait Association .84, AFQ Trait Dissociation .84, AFQ Trait Distress .80, AFQ State Association .90, AFQ State Dissociation .70, and AFQ State Distress .86. RPE and enjoyment were not significantly correlated ($r=.112$); therefore, separate analyses for each dependent variable are necessary.

Enjoyment

It was hypothesized that participants in the most preferred music condition would report higher levels of enjoyment than those in the least preferred and no music conditions. It was further hypothesized that participants in the low intensity exercise condition would report higher levels of enjoyment than those in the moderate and high intensity conditions. Thus, it was hypothesized that those in the most preferred music and low intensity condition would report the highest levels of enjoyment. Finally, it was hypothesized that the three subscales of the trait AFQ (association, dissociation, and distress) and the difference in preferred and actual RPE would act as covariates. A 3

(Music Condition) X 3 (Exercise Intensity) ANCOVA including all covariates was conducted on enjoyment levels. Results revealed that the trait dissociation subscale of the AFQ and the difference in preferred RPE and actual RPE acted as significant covariates. Therefore, a second 3 X 3 ANCOVA was conducted on enjoyment with the trait dissociation subscale and the preferred intensity score as covariates and the association and distress subscales omitted. Although observed differences in means were in the hypothesized direction for the music conditions, there were no significant main effects and no significant interaction. There were no significant main effects for exercise intensity. The dissociation subscale of the AFQ ($\eta^2 = .03$) and the difference in RPE ($\eta^2 = .04$) were significant covariates. The means for each condition are reported in Table 1.

Table 1

Means and Standard Deviations for Enjoyment

Intensity		No Music	Least Preferred Music	Most Preferred Music	Total
Low	Means	16.22	15.43	16.00	15.88
	(SD)	(6.56)	(7.23)	(6.46)	(6.67)
Moderate		16.00	16.67	18.86	17.16
		(5.99)	(5.51)	(5.96)	(5.86)
High		16.00	15.10	17.55	16.21
		(4.33)	(4.88)	(4.49)	(4.61)
Total		16.07	15.71	17.45	16.40
		(5.63)	(5.92)	(5.73)	(5.78)

RPE

It was hypothesized that participants in the most preferred music condition would report lower RPE scores than those in the least preferred and no music conditions. It was further hypothesized that participants in the low intensity exercise condition would report lower RPE scores than those in the moderate and high intensity conditions. Thus, it was hypothesized that those in the most preferred music and low intensity condition would report the lowest RPE scores. Finally, it was hypothesized that the three subscales of the trait AFQ (association, dissociation, and distress) and the preferred RPE would act as covariates. A 3 (Music Condition) X 3 (Exercise Intensity) ANCOVA including all covariates was conducted on RPE scores. Results revealed no significant covariates. Therefore a 2 (Music Condition) X 3 (Exercise Intensity) ANOVA was conducted. There was a significant main effect for intensity, $F(2, 166) = 99.60$, $p < .00$, accounting for 55% of the variance in RPE scores. A post hoc analysis using Bonferroni's correction indicated that those in the high ($\underline{M} = 13.98$) intensity exercise condition reported significantly higher RPE scores than those in the moderate ($\underline{M} = 10.67$) and low ($\underline{M} = 7.76$) intensity exercise conditions and those in the moderate ($\underline{M} = 10.67$) intensity exercise condition reported significantly higher RPE scores than those in the low ($\underline{M} = 7.76$) intensity exercise condition. There was no main effect for music condition and no interaction. The means for each condition are reported in Table 2.

Table 2

Means and Standard Deviations for RPE

Intensity		No Music	Least Preferred Music	Most Preferred Music	Total
Low	Means	8.27	7.39	7.64	7.76
	(SD)	(2.10)	(1.92)	(1.84)	(1.96)
Moderate		10.71	10.82	10.48	10.67
		(2.70)	(2.65)	(2.42)	(2.56)
High		13.61	13.91	14.40	13.98
		(1.61)	(2.67)	(2.28)	(2.25)
Total		10.69	10.66	10.73	10.69
		(3.07)	(3.60)	(3.52)	(3.40)

Manipulation checks

Music satisfaction.

A one-way ANOVA was conducted on the music satisfaction questionnaire to serve as a manipulation check to ensure that those in the most preferred music group were, in fact, satisfied with their music choice. The ANOVA was significant, $F(1, 130) = 67.56$, $p < .00$, $\eta^2 = .34$, with those in the most preferred music condition ($\underline{M} = 4.40$) reporting higher levels of satisfaction with music choice than those in the least preferred music condition ($\underline{M} = 2.46$).

State AFQ.

As a manipulation check separate 3 (Music Condition) X 3 (Exercise Intensity) ANCOVA's were conducted on each of the state AFQ subscales with the corresponding trait subscale as the covariate (e.g., state dissociation subscale with the trait dissociation as the covariate). It was hypothesized that those in the high intensity exercise condition would report higher levels of association and distress than those in the low and moderate exercise conditions and that those in the most preferred music condition would report higher levels of dissociation than the least preferred and no music conditions.

When controlling for trait association, results indicated that those in the high intensity condition associated significantly more than those in the moderate and low intensity conditions and those in the moderate intensity conditions associated more than those in the low intensity condition, $F(2, 196) = 10.98$, $p<.00$, $\eta^2 = .10$. When controlling for trait distress, results indicated that those in the high intensity condition reported higher levels of distress than those in both the moderate and low intensity conditions, $F(2, 196) = 24.15$, $p<.00$, $\eta^2 = .20$. There were no significant differences among conditions for trait dissociation. There were no significant differences on any of the state AFQ scores among the music conditions. Means and standard deviations of the dissociation, distress, and association subscales are reported in Tables 3, 4, and 5, respectively.

Table 3

Means and Standard Deviations for Dissociation

Intensity	No Music	Least Preferred Music	Most Preferred Music	Total

Low	Means	37.35	39.13	42.32	39.60
	(SD)	(11.30)	(7.70)	(10.56)	(9.98)
Moderate		37.17	38.30	40.00	38.44
		(10.30)	(9.20)	(10.41)	(9.90)
High		36.86	37.05	41.18	38.36
		(10.53)	(12.43)	(11.18)	(11.41)
Total		37.13	38.16	41.18	38.80
		(10.55)	(9.83)	(10.56)	(10.41)

Table 4

Means and Standard Deviations for Distress

Intensity		No Music	Least Preferred Music	Most Preferred Music	Total
Low	Means	14.13	11.91	11.68	12.59
	(SD)	(5.79)	(5.03)	(5.51)	(5.48)
Moderate		15.00	12.90	12.43	13.47
		(8.59)	(5.36)	(5.25)	(6.63)
High		18.27	21.64	22.77	20.90
		(9.14)	(10.50)	(9.10)	(9.64)
Total		15.80	15.48	15.68	15.62

	(8.04)	(8.48)	(8.48)	(8.30)

Table 5

Means and Standard Deviations for Association

Intensity		No Music	Least Preferred Music	Most Preferred Music	Total
Low	Means	39.30	31.83	32.73	34.65
	(SD)	(13.93)	(9.76)	(12.84)	(12.54)
Moderate		40.30	43.30	36.10	40.00
		(13.61)	(11.40)	(11.32)	(12.40)
High		41.20	43.05	45.00	43.08
		(12.42)	(13.00)	(14.00)	(13.03)
Total		40.30	39.30	38.00	39.20
		(13.14)	(12.48)	(13.64)	(13.10)

Attend to music

In retrospect, one weakness of the previous analyses is that there was no control for whether or not the participants actually paid attention to the music. Although the state AFQ did contain a question specifically asking how much the participants concentrated on the music, it was not part of the hypothesized analyses. As an exploratory analysis, a 3 (Music) X 3 (Intensity) ANOVA was conducted on enjoyment using the portion of the sample that had paid attention to the music. This portion of the sample consisted of participants that scored above the mid-point on state AFQ item 31 ("Concentrating on the music") and therefore contained only participants in either the most preferred or least preferred music conditions. Results revealed a significant main effect for music, $F(1,86) = 4.18$, $p = .044$), accounting for roughly 5% of the variance in exercise enjoyment. Therefore, when participants paid attention to the music, those in the most preferred music condition ($n = 55$, $\underline{M} = 17.90$) enjoyed the exercise significantly more than those in the least preferred music condition ($n = 37$, $\underline{M} = 15.57$). There was no significant main effect for intensity and no significant interaction.

Chapter 4

Discussion

Enjoyment by music condition

Results of the study indicated that music preference does have a small effect on exercise enjoyment, as long as one pays attention to the music. If one pays attention to the music being played during exercise then that person will enjoy that exercise significantly more when listening to preferred music compared to nonpreferred music. On the other hand, if a person does not pay attention to the music, then music preference does not appear to be as important. Although there were no significant differences among the participants that did not pay attention to the music, observed differences indicated that participants who listened to music they preferred did enjoy their exercise bout more than those who listened to music they did not prefer or who did not listen to any music. Despite the fact that the effect of music preference on exercise enjoyment is only 5%, it is important to point out that individual differences may exist. Therefore, music preference may have a greater influence on exercise enjoyment for some.

It may be that allowing the participants to listen to music they like positively influenced their mood, which may have lead to their feeling as though they were enjoying the exercise. On the other hand, the participants who were required to listen to music they disliked may have experienced a negative change in mood. Therefore, the higher levels of enjoyment in participants listening to their most preferred music may have been due to a better mood as a result of the music. Another explanation may be that the participants that listened to music they liked dissociated more by paying more attention to the music, thus not concentrating on the physical discomfort caused by the exercise; whereas participants that were required to listen to music they did not like may have tried to block out the music by focusing their attention other aspects such as physical sensations caused by the exercise. Although there were no significant differences in state dissociation among music conditions when trait dissociation was factored out, observed differences did show that participants in the most preferred music condition did dissociate more than participants in the least preferred music condition.

Although there were a number of valuable findings, the current study also contained limitations which may have masked the true effects of music preference and exercise intensity on enjoyment. The limitation that may have had the greatest influence on the results was the music selection. Since the participant was limited to selecting her most or least preferred music from a list of six types there is a possibility that the type of music selected was not the participant's truly most preferred or truly least preferred type. For example, a participant may have liked techno music the most but was unable to select that type of music, as it was not one of the six choices. Additionally, even if the type of music was the participant's most preferred, the songs themselves may not have been. For example, if a participant's most preferred type of music was country there is still a possibility that that person will dislike one of the artists or songs on the experimental compact disc. Although results of a manipulation check showed that participants in the most preferred music condition were significantly more satisfied with the music type than participants in the least preferred music condition, this simply indicates that they liked the music more compared to those in the least preferred condition, not that the music was truly their most preferred. Even though the limited selection of music types allowed for controlling music tempo, it may be more beneficial to sacrifice tempo and allow for more music types to accurately tap into the participant's truly most preferred music.

Following from the results of this study, future research should allow participants to bring in self-selected music. Although it will not be as easy to control for tempo, self-selected music would be more representative of the participant's most preferred music. A second suggestion is to include video as another independent variable. Since many health facilities also include television screens it would be beneficial to determine if video has different effects than music on exercise enjoyment. Finally, the current study did not assess how often the participants listened to music in general which may have influenced the effects of music on enjoyment. Therefore, future research should consider regular music listening habits.

Enjoyment by intensity condition

Results concerning the effects of exercise intensity on exercise enjoyment were not in the hypothesized direction. There were no significant differences among the conditions. In addition, observed differences indicated an alternative pattern. It was hypothesized that when participants exercised at a low intensity, they would enjoy the exercise bout more than those who exercised at a moderate or high intensity. Yet participants exercising at a moderate intensity enjoyed the exercise more than those who were exercising at a low or high intensity.

The surprising results may be explained by a limitation of the sample characteristics. Due to Institutional Review Board requirements, participants were allowed to participate only if they were classified as low risk by ACSM guidelines. Unfortunately, it was discovered that it is not very prudent to have low risk persons exercise at a low intensity. It is a strong possibility that low intensity exercise elicited feelings of boredom and being held back. Subsequently, when the low intensity exercise condition is dropped from the analysis, the difference in enjoyment between the most preferred and least preferred music conditions is even more evident. Mean differences on enjoyment between the most preferred music condition and least preferred music condition increased from .43 to 2.17 when the low intensity condition was dropped. Similar results were found in the previously mentioned study conducted by Boutcher and Treske (1990). Results indicated that participants had a greater positive affective response to music compared to sensory deprivation in a moderate and high intensity exercise condition but not in a low intensity condition. Therefore, future research that only involves apparently healthy participants should concentrate on moderate and high intensity exercise, as low intensity conditions are not particularly useful.

The majority (n=169) of the participants in the current study were exercisers with 90 in the preparation stage of exercise (“currently exercising but not regularly”, 38 in the action stage (“currently exercising regularly”), 40 in the maintenance stage (“have been exercising regularly for at least six months”) and only 19 in the contemplation stage (“currently do not exercise but am thinking about it”). The large differences in stages of exercise prompted an exploratory analysis to examine the effects of exercise stage on enjoyment, RPE, and preferred intensity. Results of three one-way ANOVA’s revealed that stages of exercise did significantly affect exercise enjoyment, $F(4, 192) = 4.18$, $p = .003$, $\eta^2 = .08$. Post hoc analysis indicated that those in the maintenance stage enjoyed the exercise significantly more than those in the contemplation stage. There was no effect of stages of exercise on RPE. There was a significant effect of stages of exercise on preferred intensity, $F(4, 181) = 8.71$, $p<.001$, $\eta^2 = .16$. Post hoc analysis revealed that those in the maintenance stage reported significantly higher preferred intensities than participants in all other stages, and those in the action stage reported significantly higher preferred intensities than those in the precontemplation stage.

The fact that the stages of exercise had an effect on some of the key variables is further evidence that individual differences may exist. Additionally, it indicates that results may be different if moderate or high risk participants or more participants who were non-exercisers had been included.

Enjoyment with preferred intensity

Previous research has indicated that dissociation and exercising close to one's preferred intensity also influence exercise enjoyment. The data revealed that the more participants dissociated during exercise the more they enjoyed the exercise. Therefore, paying more attention to external factors (i.e., music, daydreaming, etc.) may result in greater exercise enjoyment. Also, participants were more likely to enjoy the exercise bout if they were exercising at or slightly above their preferred intensity than if they were exercising below their preferred intensity.

Future research should take a closer look at the effects of music preference on exercise enjoyment when the participants are asked to exercise at their preferred intensity. The current study has indicated that exercising at or just above one's preferred intensity does influence enjoyment, and allowing participants to exercise at their preferred intensity in future studies may reveal the true effects of music on exercise enjoyment.

RPE by music condition

According to the current study, music preference does not appear to affect one's perceived effort during exercise. There were no differences among those exercising while listening to music they liked, music they did not like, or while not listening to any music during the exercise. It may be possible that the effects of exercise intensity or RPE overshadowed the effects of music condition resulting in no differences between conditions.

RPE by intensity condition

Results also revealed, as expected, that the higher intensity at which one is exercising, the more effort that person will put forth. It is no surprise that participants reported significantly higher RPE scores when exercising at a high intensity and significantly lower RPE scores when exercising at a low intensity. Results of a manipulation check may help clarify the relationship between exercise intensity and RPE scores. When trait association and distress were factored out, participants in the high intensity exercise condition reported higher levels of state association and distress than those in the moderate and low intensity exercise conditions. It may be that the higher intensity exercise induced greater feelings of discomfort thus demanding more attention to bodily feedback (association) in turn creating higher levels of distress and greater feelings of perceived effort.

Conclusions

Although there is still a large amount of variance to be accounted for in exercise enjoyment, the current study has indicated three factors that influence exercise enjoyment to some extent. These factors and the percent of variance they accounted for in exercise enjoyment are as follows: music preference for persons attending to music (5%), preferred intensity (4%), and dissociation (3%).

The current study is important for two main reasons: it fills a gap in the existing body of literature, and it has considerable practical implications. Previous research has, for the most part, compared the effects of listening to music to not listening to music as regards exercise enjoyment. Also, past studies involving music have mostly concentrated on one exercise intensity. Accordingly, this study filled a gap in the literature by including a least preferred or disliked music condition and assessed the effects of music on enjoyment across exercise intensities ranging from low to high.

More and more public and private exercise facilities are making music and television individualized for their patrons. The results of the current study question the financial worth of this equipment. Individualized music stations will be beneficial only to those patrons who pay attention to the music. These patrons will benefit by enjoying their exercise session more, possibly increasing their adherence, resulting in better physical and psychological health for the patron and extending financial benefits for the facility. On the other hand, individualized music may not influence those patrons who do not pay attention to music. Therefore, it would be beneficial for a health facility to know how much patrons pay attention to music before investing large amounts of time and money in individualized music equipment. Secondly, it is important for facilities to consider how much influence music will have in the enjoyment of patrons. Music accounted for only 5% of the variance in enjoyment for those who paid attention to the music. Therefore, there are other factors that may play a larger role in exercise enjoyment. In conclusion, individualized music will increase the enjoyment of patrons that pay attention to the music, but health facilities need to weigh the costs and benefits of investing in the equipment.

In sum, listening to music one likes during exercise may result in higher levels of enjoyment if that person pays attention to the music. Although exercise intensity has not been shown to significantly affect enjoyment, it is suggested that exercising at a moderate or high intensity may result in higher levels of enjoyment compared to exercising at a low intensity. Yet it has been shown that exercising at or slightly above one's preferred intensity does positively affect exercise enjoyment. Despite the fact that music preference did not appear to influence feelings of perceived exertion, it is possible that the effects of exercise intensity may have masked any effects of music condition. Following from the findings of the current study, it is suggested that health facilities evaluate whether or not patrons pay attention to music during exercise to determine the financial benefits of individualizing music.

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Appendices

APPENDIX A

Demographic Form

1. Gender: Female or Male #____

2. Age: _______

3. What time did you wake up this morning? _____ Current time?____

4. How many hours of sleep did you get last night? _______

5. Have you walked/ran on a treadmill before? Yes or No

6. Which of the following statements best describes you? Please read all 5 statements and then circle your response.

   a. I currently do **not** exercise and do not intend to start exercising in the next 6 months.
   b. I currently do **not** exercise, but I am thinking about starting to exercise in the next 6 months.
   c. I currently exercise some, but not **regularly** (*regularly* is defined as exercising 3 or more times per week for at least 30 minutes per session).
   d. I currently exercise **regularly.**
   e. I have been exercising **regularly** for the past six months or longer.

If you selected **c**, **d**, or **e** please answer the following questions...

7. What mode (s) of exercise do you normally engage in? Frequency? Duration?Intensity (RPE)?

   1) ______________________________ _____ _____ _____
   2) ______________________________ _____ _____ _____
   3) ______________________________ _____ _____ _____
   4) ______________________________ _____ _____ _____

8. What is your preferred exercise intensity? (See above sheet) ________________________

STOP HERE

HR (20 seconds)

Heart rate, prior to exercise ____
Heart rate, after exercise ____
Heart rate, 15 minutes after exercise ____

RPE
10 minutes _____
20 minutes _____

Height_____ Weight_____ PAR _____

Assigned MPH _______ Total Distance _____

CD played__________________________

APPENDIX B

Music Preference Questionnaire

Please indicate the degree to which you would like to listen to the following types of music while engaging in aerobic activity (e.g. walking, running, biking, etc)

1. **Alternative (Matchbox 20, Oasis, etc)**
   1 2 3 4 5 6
   Not at all Very much

2. **Classic Rock**
   1 2 3 4 5 6
   Not at all Very much

3. **Rap**
   1 2 3 4 5 6
   Not at all Very much

4. **Country (Tim McGraw, Trisha Yearwood, etc)**
   1 2 3 4 5 6
   Not at all Very much

5. **Oldies**
   1 2 3 4 5 6
   Not at all Very much

6. **Hip Hop**
   1 2 3 4 5 6
   Not at all Very much

Please choose your most preferred and least preferred types of music from the following list:
Alternative, Classic Rock, Rap, Country, Oldies, Hip Hop

Most Preferred (Most liked) ________________________

Least Preferred (Most hated or least liked) ________________________

APPENDIX C

Music Satisfaction Questionnaire

Please indicate how satisfied you were with each aspect of the music you listened to while running on the treadmill.

1. **Type** (i.e. country, oldies, etc.)

1	2	3	4	5	6
Not at all					Very much

2. **Tempo** (how fast the beat was)

1	2	3	4	5	6	7
Too slow			Just right			Too fast

3. **Volume**

1	2	3	4	5	6	7
Too soft			Just right			Too loud

APPENDIX D

Attentional Focusing Questionnaire

Please circle the response that indicates how much you engaged in each of the following activities while walking on the treadmill:

1 2 3 4 5 6 7
did not do at all **did a lot**

1. letting your mind wander (daydreaming)
1 2 3 4 5 6 7
2. monitoring specific body sensations (e.g., leg tension, breathing rate)
1 2 3 4 5 6 7

3. trying to solve problems in your life
1 2 3 4 5 6 7

4. paying attention to your general level of fatigue
1 2 3 4 5 6 7

5. focusing on how much you are suffering
1 2 3 4 5 6 7

6. singing a song in your head
1 2 3 4 5 6 7

7. focusing on staying loose and relaxed
1 2 3 4 5 6 7

8. wishing the walk would end
1 2 3 4 5 6 7

9. thinking about school, work, social relationships, etc.
1 2 3 4 5 6 7

10. focusing on your performance goal
1 2 3 4 5 6 7

11. wondering why you are even walking in the first place
1 2 3 4 5 6 7
12. making plans for the future (e.g., grocery list)
1 2 3 4 5 6 7

13. getting frustrated with yourself over your performance
1 2 3 4 5 6 7

14. writing a letter or paper in your head
1 2 3 4 5 6 7

15. paying attention to your form or technique
1 2 3 4 5 6 7
16. reflecting on past experiences
1 2 3 4 5 6 7

17. paying attention to your walking rhythm
1 2 3 4 5 6 7

18. thinking about how much you want to quit
1 2 3 4 5 6 7

19. focusing on the outside environment (scenery)
1 2 3 4 5 6 7

20. thinking about strategy or tactics
1 2 3 4 5 6 7

21. counting (e.g., objects in the environment)

1 2 3 4 5
6 7

22. monitoring your pace
1 2 3 4 5
6 7

23. thinking about how much the rest of the walk will hurt
1 2 3 4 5
6 7

24. meditating
1 2 3 4 5
6 7

25. encouraging yourself to walk faster
1 2 3 4 5
6 7

26. trying to ignore all physical sensations
1 2 3 4 5
6 7

27. concentrating on the walk
1 2 3 4 5
6 7

28. wondering whether you will be able to finish the walk
1 2 3 4 5
6 7

29. thinking about pleasant images
1 2 3 4 5
6 7

30. monitoring the time of the walk
1 2 3 4 5
6 7

31. concentrating on the music
1 2 3 4 5
6 7

32. trying to ignore the music
1 2 3 4 5
6 7

APPENDIX E

Enjoyment Scale

Please choose the answer which best describes how you feel.

1. I enjoyed walking/running on the treadmill.

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

2. Walking/running on the treadmill was fun.

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

3. I think walking/running on the treadmill was boring.

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

4. I think walking/running on the treadmill was quite enjoyable.

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree